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A. J. Ohlrogge

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SPARK and PREMERGE as Biostimulants for Corn

A. J. Ohlrogge, Department of Agronomy

Biostimulants are growth regulating chemicals that beneficially influence the "metabolic pathways" in plants. When used as herbicides, these regulants contribute to the retardation or death of weeds. When applied properly to economic crops, they may result in greater yield.

Exactly how biostimulants work within the plants to cause grain yield increases is not fully understood. The answer must come from further basic research.

The first growth regulating chemical to be used extensively in corn production is the compound DNBP, which presently appears in two commercial products—SPARK and PREMERGE. There is considerable interest (and some confusion) concerning corn biostimulants in general and use of these products specifically. The purpose of this publication, therefore, is to answer the questions frequently being asked by growers and commercial applicators alike.

1. What are SPARK and PREMERGE?

They are registered trademarks for products containing the plant growth regulant 4,6 dinitro-o-sec butyl phenol (DNBP). PREMERGE is produced and marketed by Dow Chemical Co. of Midland, Michigan. SPARK is a product formulated and marketed by Helena Chemical Co. of Memphis, Tennessee.

2. What is their effect on corn yield?

When properly applied, these biostimulants can increase corn grain yields 5 to 10 percent.

3. How do SPARK and PREMERGE differ?

SPARK is specially formulated as a biostimulant for corn. It contains DNBP plus a wetting agent and an antifoaming agent. One pint of SPARK treats an acre of corn.

PREMERGE is actually a 30-year-old herbicide that contains a high concentration of DNBP. One pint treats between 30 to 50 acres when used as a corn stimulant. However, a non-ionic wetting agent needs to be added to the spray solution. Follow label instructions when using either product.

4. How much do they cost?

SPARK is being specially designed for corn and costs about \$1.50 per acre, including the wetting agent and antifoaming agent. It is a convenient and less hazardous product to use.

The chemical cost of PREMERGE is about 3 or 4 cents an acre. Cost of the wetting agent which must be added is about 15 to 20 cents per acre.

Cost of application is the same for both—from \$2 to \$4 per acre.

5. In what form does the active ingredient exist?

In both SPARK and PREMERGE, the active ingredient exists as the alkanolamine salts of the ethanol isopropanol series of dinoseb.

6. What is PREMERGE 3?

In 1976, Dow Chemical Co. replaced their ethanol isopropanol salt of dinoseb with a new ethanol salt called PREMERGE 3. Although untested as a biostimulant for corn, all evidence on herbicidal action indicates it will perform the same as the older salt form.

7. What words are used to identify this biostimulant?

Although nomenclature changes with time, the more recent terms are: DINOSEB—a general term applying to all of the dinitro phenols; DINITRO—an old term applying to all of the dinitro compounds; and DNBP—

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abbreviation for the compound 4,6 dinitro-o-sec butyl phenol. The most recent description is: 2 sec-butyl 4,6-dinitrophenol.

8. When are SPARK and PREMERGE applied?

The prime application period begins when the unemerged tassel is $\frac{1}{2}$ inch long (Figure 1) and ends when the unemerged tassel is about 7 inches long. Do not apply later than 2 weeks before the corn tassel emerges from the leaf whorl—i.e., when tassels are becoming visible as you look over the field.

9. How tall is the corn at application time?

Tassels begin to develop when corn is about knee high. At that time, start checking your corn by splitting the stalk or carefully unrolling the leaves to expose the growing point.

10. How are SPARK and PREMERGE applied?

They are broadcast over the top of the growing corn plant either with ground equipment or by aerial applications.

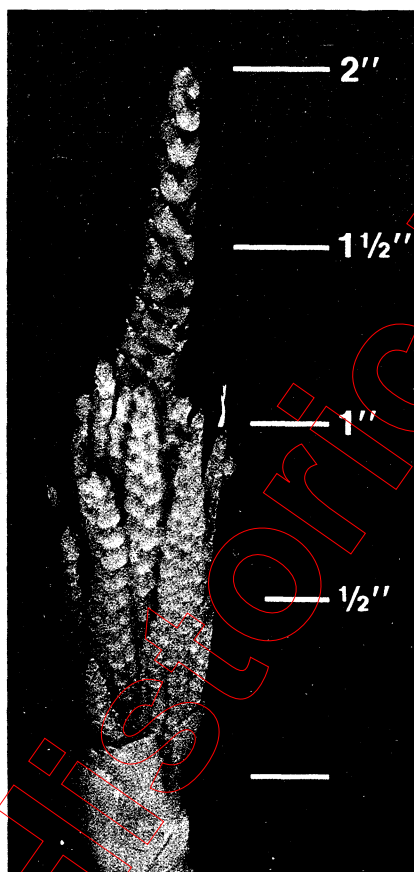


Figure 1. The time to apply DNBP is when the unemerged tassel is between $\frac{1}{2}$ inch and 7 inches long. That interval may last 1 to 3 weeks, depending upon growing conditions, variety, time of planting and location. This developing tassel is about 2 inches long, a prime time in which DNBP application could be expected to stimulate grain yield.

Photo courtesy of Dr. John Hanway, Agronomy Dept., Iowa State University and Successful Farming magazine.

11. If ground-applied, is high clearance equipment required?

Yes, normally. However, with hybrids planted early, farm sprayers can probably be used during the earlier part of the prime application period.

12. What volumes of spray solution are used?

Plan on 3 to 5 gallons per acre with aerial equipment, and 10 to 20 gallons per acre with ground equipment.

13. What type of wetting agent should be used with PREMERGE?

In Purdue tests, $\frac{1}{2}$ pint of EPA-approved non-ionic wetting agents, such as Trionic XX-77 and Tween 20, were used in 100 gallons of spray solution.

14. What is the most common problem associated with using SPARK or PREMERGE as a biostimulant on corn?

In most cases, farmers who got no response had applied the chemical too late. Be sure the unemerged developing tassel is less than 7 inches long.

15. Will SPARK and PREMERGE have EPA national labels in 1976?

As of June 1976, both companies were in the process of obtaining national EPA labels for this new use of DNBP.

16. Can SPARK or PREMERGE be used on popcorn and sweet corn?

If the label usage is approved for corn and no exceptions are set forth, then it can be used on any of these crops.

17. Can treated corn be used for silage?

Under current labels, treated corn cannot be used for silage. This status could change during the season, however, depending on action taken by state pesticide administrators.

18. How does DNBP affect corn to increase yield?

It usually causes the corn to pollinate a couple days earlier. Since the date of physiological maturity appears to be unaffected, this means the corn filling period is increased by about 2 days. In addition, barrenness is usually decreased and more kernels per ear are produced.

19. Does DNBP benefit corn in other ways?

Yes, DNBP is a potent fungicide and may lessen smut damage. Also, corn grain is occasionally reported to be dryer at harvest time.

20. Is DNBP effective for hybrid seed corn production?

Fairly extensive testing was carried out by commercial seed corn producers in both 1974 and 1975. In general, they report good results, but with this

word of caution: "**Do not** treat extensive acreages until experience is gained, because DNBP influences 'nicking'." In other words, it may either help solve problems or create difficult nicking problems.

21. Do all hybrids respond the same to DNBP?

Differences between hybrids probably do exist, but as yet no careful tests have been run to measure such differences.

22. When and where was DNBP first commercially used as a biostimulant on corn?

Pioneer research work with DNBP was begun in 1968 at Purdue University and has involved the following graduate students: Sherback, Oplinger, Hatley, Winters, Herrman, Collins, Buettner and Pitombiera. In May 1974, Purdue's Agronomy Department, in cooperation with Dow Chemical Co., obtained an experimental label in Indiana. An estimated 40,000 acres were treated in the state that year.

In 1975, both Dow and Helena obtained labels in Indiana and other Corn Belt states. It is estimated that DNBP was used on 250,000 acres in Indiana and 250,000 acres in other states that year.

23. Has DNBP been tested in other states?

Yes, tests have been conducted in several states, and here is what has been reported.

Wisconsin: DNBP has been tested at the University of Wisconsin for 3 years. Most trials showed positive

responses, but the percent increase in yield has been less than that obtained at Purdue.

Illinois: Two tests were conducted in 1975. The one at Champaign-Urbana showed no effect to DNBP application. The other at Dixon Springs showed a highly significant decrease (at the one percent probability level) across four hybrids. The DNBP was applied 13 days before the corn tasseled using 40 gallons of spray solution. That may have resulted in runoff into the leaf whorl, a complication which, in certain situations, could have deleterious effects. Barrenness was increased, but at the same time so was double eariness. Such opposite effects from one chemical in the same experiment are difficult to understand.

Nebraska: Dr. T. G. Sherbeck has tested the biostimulant on his commercial farm for 3 years with good results.

Other States: Replicated tests have also been conducted in Iowa, Minnesota and several southern states on university experimental farms. In some of these trials, the corn tasseled within 10 days after DNBP application—too late to do any good—and therefore, no increases were obtained. In other tests, increases in yield of 5 percent were strongly indicated.

24. What about DNBP treatment for other crops?

Several replicated tests have been carried out on soybeans with no beneficial results being observed. Additional tests on wheat and sorghum need to be run before definitive answers can be given.